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Oxygen Saturation (SPO₂) of Covid-19 Patients



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Abstract

One of the emergency problems of Covid-19 patients is a decrease in oxygen saturation (SpO₂). Factors that affect the decrease in oxygen saturation, age, immune system, and gender. The purpose of this research was to identify Oxygen Saturation (SpO₂) in Coronavirus Disease (Covid-19) patients. The research design is descriptive. The population in this study was all Covid-19 patients at the Aminah Blitar Islamic Hospital starting last month December 2020 to March 2021 totaling 346 and the number of samples was 185. The research instrument used data studies on the medical records of Covid-19 patients. The sampling technique used purposive sampling. The statistic test used frequency distribution. The results of this research indicated that from 185 respondents there were 77 (41.4) respondents who did not experience hypoxemia and 108 (58.6) respondents experienced hypoxemia. Covid-19 must be watched out for because of its relatively fast transmission, has a mortality rate that cannot be ignored, and there is no definitive therapy yet. A decrease in oxygen saturation (SpO₂) is an important thing that needs to be considered in Covid-19 patients.

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INTRODUCTION

In early 2020, there was a new type of coronavirus, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the disease was called coronavirus disease 2019 (COVID-19). Until now, it has been confirmed that the coronavirus disease (COVID-19) outbreak has attacked 216 countries or regions in the world, including Indonesia (World Health Organization, 2020). Currently, the spread of SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) from human to human is the main source of transmission so that the spread becomes more aggressive. Transmission of SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) from symptomatic patients occurs through droplets released when coughing or sneezing. (Setiawan et al., 2020). There are 216 countries infected with COVID-19. The first COVID-19 case in Indonesia was reported on March 2, 2020, with 2 cases. East Java Province became the highest zone of positive patients, namely the city of Surabaya and Sidoarjo Regency.

The clinical symptoms of COVID-19 differ in each individual due to the influence of comorbid factors. Most COVID-19 patients who have comorbid diseases such as diabetes mellitus, hypertension, and cardiovascular disease are more likely to experience conditions that are easily deteriorating and even cause death (Ye et al., 2020). Other symptoms of Covid-19 can affect the gastrointestinal system, the olfactory system (ears, nose and throat), the cardiovascular system, and the respiratory system. In the respiratory system, one of the symptoms that often appears is a decrease in oxygen saturation characterized by changes in respiratory frequency, depth or rhythm, breath sounds, cyanosis (in nails, lips, mucous membranes and skin), restlessness, anger, confusion, decreased level of consciousness, shortness of breath, or difficulty breathing (Enie Noviastrari and Kusman Ibrahim, 2020). The Covid-19 virus itself is a virus caused by the SARS-Cov 2 virus, the SARS-Cov 2 virus contains an S protein that can cause spikes in cells so that the virus is easy to enter. After entering the cell through RNA (Ribonucleic Acid) it stimulates ACE 2 (Angiotensin Converting Enzyme 2) receptors. ACE 2 (Angiotensin Converting Enzyme 2) receptor serves to enter the virus into cells. So it affects the immunology of the host itself to decrease and an inflammatory response occurs in the host's own body. The

inflammatory response then causes a cytokine storm that causes spots on the lungs so that the exchange of oxygen (O₂) in the lungs is disrupted and there is a decrease in oxygen saturation (SpO₂). Decreased Oxygen Saturation (SpO₂) causes body tissues to lose a lot of oxygen so that it can cause death (Yuliana, 2020).

Oxygen saturation is one indicator of oxygenation status. Oxygen saturation is a measure of how much oxygen percentage hemoglobin is able to carry (Berman, 2016). The normal range for oxygen saturation is >95%-100%, although lower measurements may be normal in some people (Aini, 2014).

According to Berman, Snyder, Frandsen (2016) & Klabunde (2015), the value of oxygen saturation is what percentage of all hemoglobin binding sites occupied by hemoglobin, pulse oximetry is a non-invasive tool that measures the oxygen saturation of arterial blood placed on the fingertips, the mother finger, nose, earlobe or forehead and pulse oximetry can detect hypoxemia before clinical signs and symptoms appear. According to (Fadlilah, 2017), a normal SpO₂ value indicates that perfusion in the tissue is in good condition. Good perfusion is characterized by capillary refill time (CRT) and is also supported by normal oxygen saturation.

Based on the results of a preliminary study that was carried out at the Aminah Blitar Hospital, the average number of COVID-19 patients treated at Aminah Hospital from December 2020 to March 2021 was 346, most of them experienced a decrease in oxygen saturation (SpO₂), with an average age of 346. average 50 years. On January 22, 2021, Aminah Blitar Hospital was designated as one of the referral hospitals for COVID-19 in East Java, which was previously a buffer hospital.

Most of the deaths were caused by respiratory failure (The respiratory system is unable to carry out its function to distribute oxygen into the blood and organs, then remove carbon dioxide from the blood. **This causes the body to lack oxygen** as much as 45% and pneumonia (inflammation of the lungs caused by infection) as much as 55%.

Based on the background of the problem above, the researcher is interested in researching "Saturation". Oxygen (SpO₂) of Covid-19 Patients". The formulation of the research problem is how the oxygen saturation (SpO₂) in Covid-19 patients is.

The purpose of this study was to identify Oxygen Saturation (SpO₂) in Coronavirus Disease

(COVID-19) Patients at Aminah Blitar Islamic Hospital.

The theoretical benefit of this research is that it is expected to provide nursing knowledge, especially Surgical Medical Nursing (KMB), as a contribution to science in the form of empirical data on Oxygen Saturation (SpO₂) in Coronavirus Disease (COVID-19) Patients at Aminah Blitar Islamic Hospital. The practical benefits of this research can be used as a basis for health workers in providing education to the public and providing nursing care to Covid-19 patients.

METHODS

This research was a quantitative research with a descriptive design. The population of was 185 samples at Aminah Islamic Hospital Blitar from December 2020 to March 2021. The sampling technique used purposive sampling.

The variable in this study was oxygen saturation (SpO₂) of Covid-19 patients. This research did not take patients with comorbidities and SpO₂ measurements while the patient was still in the Emergency Unit.

The data collection tool in this research was study data (case study) from patient medical records using a check list sheet. The data collection was carried out on June 15-18 June 2021. Data analysis used central tendency.

RESULT

General data

1. Distribution of respondents by gender

Table 1 Distribution of Respondents by Gender in Covid-19 Patients at RSI Aminah Blitar

No	Gender	Frequency	Percentage (%)
1.	Man	116	62.7
2.	Woman	69	37.3
Total		185	100.0

Table 1. above, it can be seen that male respondents with Covid-19 were 116 respondents (62.7%).

Special Data

Table 2. It is known that the respondents who experienced hypoxemia in Covid-19 patients were

108 respondents (58.4%). While the normal amounted to 77 respondents (41.6%).

Table 2 Oxygen Saturation (SpO₂) in Covid-19 patients

No	SpO ₂ (%)	Frequency	Percentage (%)
1.	No Hypoxemia (95-100%)	77	41.6
2.	Hypoxemia (<95%)	108	58.4
Total		185	100.0

DISCUSSION

Oxygen Saturation

Based on the results of the study, it was found that there were 108 patients with Covid-19 who experienced a decrease in SpO₂ or hypoxemia (58.4%) out of 185 patients. While the normal amounted to 77 respondents (41.6%).

Oxygen saturation is the percentage of hemoglobin bound to oxygen in the arteries, normal oxygen saturation is between 95 - 100%. Oxygen saturation (SO₂) in medicine is often referred to as "SATS", to measure the percentage of oxygen bound by hemoglobin in the bloodstream. At low oxygen partial pressures, most of the hemoglobin is deoxygenated, meaning the process of distributing oxygenated blood from arteries to body tissues, normal oxygen saturation is between 95 - 100%. Factors that affect the saturation value are Hemoglobin (HB), Circulation, Activity (Astuti & Sulisty, 2019).

According to (Wang, 2020) the attachment and entry of viruses into host cells is mediated by Protein S on the surface of the virus. Protein S is the main determinant in infecting the host species as well as the tropical determinant. In SARS-CoV, protein S itself is a toxin that can cause spikes in cells that are easy for viruses to enter by binding to receptors on host cells, namely the enzyme ACE-2 (angiotensin-converting enzyme 2). according to (Yuliana, 2020). After successfully entering the cell via RNA (*Ribonucleic Acid*) subsequent translation of gene replication from the viral RNA genome. Furthermore, replication and transcription where the synthesis of viral RNA through translation and assembly of the viral replication complex. The next stage is the assembly and release of the

virus. After transmission occurs, the virus enters the upper respiratory tract and then replicates in upper respiratory epithelial cells (performing its life cycle). After that it spreads to the lower respiratory tract which stimulates ACE 2 (*Angiotensin Converting Enzyme 2*) receptors, especially in the lungs. ACE 2 (*Angiotensin Converting Enzyme 2*) The receptor serves to enter the virus into the cell. So it affects the immunology of the host itself to decrease and an inflammatory response occurs in the host's body. The inflammatory response then causes a cytokine storm to increase, resulting in a collection of secretions resulting in spots on the lungs, disrupting the exchange of oxygen (O₂) in the lungs and decreasing oxygen saturation (SpO₂). according to (Ali et al., 2020), the factors that affect the decrease in oxygen saturation are age, body resistance, and gender.

According to (Siagian, 2020) the age category of the elderly who are susceptible to Covid-19 is not uniform, there are those who state that the elderly aged > 80 years are at high risk of contracting the Corona Virus (according to Chinese researchers), the elderly aged > 50 years (according to the Mayor of New York) there are even Indonesian researchers stated that people aged 45-65 years were vulnerable to being exposed to the Corona Virus. According to (Malik, 2019) the elderly often experience decreased body resistance. Changes in immune function (immune) due to the effects of aging and the presence of immunosenescence in the elderly cause susceptibility to infection in neutralizing viral infections. According to (Hidayati, 2020) male residents and residents aged over 46 years, especially 60 years and over, are vulnerable to Covid-19.

Patients with Covid-19 in the elderly (46-65 years) 43.2%, of 43.2% in the elderly (46-65 years) 45.7% were male compared to female (39.1 %). According to (Fatmah, 2006) men are more susceptible to Covid-19. One of them is because the decrease in the number of B cells and T cells in elderly men is greater than women. As a result, the resulting immune response is not too adequate. In addition, testosterone affects the expression of TMPRSS2, which plays an important role in the process of entering the SARS-CoV-2 virus into body cells. With age, a person's immune system is increasingly experiencing dysfunction. As a result, elderly Covid-19 patients are increasingly vulnerable to experiencing "cytokine storms" that can

cause problems in various organs of the body and trigger respiratory failure.

Hypoxemia is a condition of decreased oxygen content (O₂) in arterial blood. Hypoxia is a condition of inadequate supply of O₂ to the tissues. Hypoxia can be caused by hypoxemia or impaired blood supply to tissues. Hypoxemia can be caused by impaired oxygenation, anemia or decreased affinity of hemoglobin (Hb) for O₂. Impaired oxygenation is hypoxemia resulting from low O₂ transfer from the lungs to the bloodstream, which is characterized by low O₂ partial pressure (PaO₂ < 80 mmHg) (Dewi et al., 2019).

Partial pressure describes the pressure of a dissolved gas to the total pressure of the gas mixture (such as the pressure of oxygen gas to the total pressure of the gas mixture in the air). The partial pressure of arterial blood oxygen as a marker of oxygenation in arterial blood can be measured from blood gas analysis. Hypoxia causes multiple organ damage and if not treated properly can result in death. Hypoxia causes an increase in the number of nucleated erythrocytes (EB) through an erythropoietin-mediated mechanism to compensate for the increased oxygen demand. Increased erythropoiesis releases immature erythrocytes into the blood circulation (Dewi et al., 2019). So the decrease in oxygen saturation (SpO₂) is very dangerous.

CONCLUSION

The conclusions in this study were that the number of Covid-19 patients who experienced a decrease in SpO₂ was 108 respondents (58.6%) with normal values of oxygen saturation (95%-100%) and hypoxemia (<95%). It was found that patients exposed to COVID-19 experienced a decrease in SpO₂ amounting to 108 patients (58.4%) from 185 patients. While the normal amounted to 77 respondents (41.6%).

SUGGESTION

Health workers are expected to serve as material for educating the public that people exposed to COVID-19 are at risk of experiencing a decrease in SpO₂.

Further research is expected to become basic data for further research in carrying out research on oxygen saturation (SpO₂) in patients with Covid-19 with a larger population.

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